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7/27/2005 1:38 AM FROM: Dirk Coldewey TO: 1 703 872-9306 PAGE: 015 OF 039

(Replacement Sheet)

Drawings

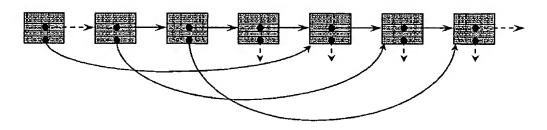


Figure 1: Linked list representation with jump pointers (Prior Art).

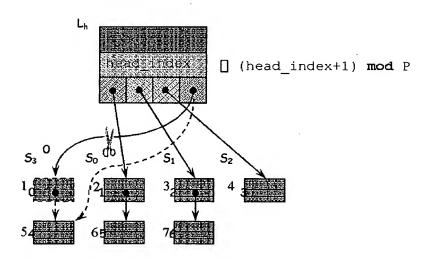


Figure 2: A prefetchable linked list representation.

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(Replacement Sheet)

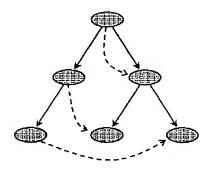


Figure 3: A tree data structure with history pointers (Prior Art).

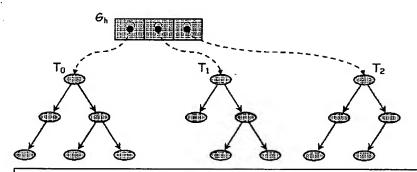


Figure 4: A prefetchable tree representation.

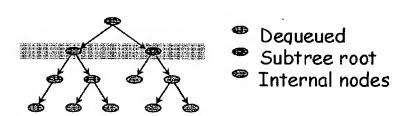


Figure 5: Transforming a Tree into a Forest.

(Replacement Sheet)

```
list_element_ptr process_list( list_ptr list )
{
   int i, p;
   iist_element_ptr s[PipeDepth];

   /* prologue */
   p = list->headers;
   for ( i=0, i<p; i++ ) {
      PREFETCH( s[i] = list->head[i] );
   }

   /* steady state */
   while ( p ) {
      for ( i=0; i<p; i++ ) {
        if ( process_element( s[i] ) == STOP )
            return s[i];
        s[i] = s[i]->next;
      PREFETCH( s[i] );
   }
   }
}
```

Figure 6: Example of a Pipelined Linked List traversal.

(Replacement Sheet - drawings separated from claims section)

```
Traverse( forest ptr forest )
    /* local variables */
   stack stacks[PipeDepth]; /* PipeDepth stacks */
   tree ptr n;
   int i, trees_left = PipeDepth;
    struct |
     tree_ptr node;
      stack_ptr stack;
    } traversal[PipeDepth];
                                /* traversal state descriptor */
    /* prologue */
   for ( i=0; i<PipeDepth; i++ ) {
      traversal[i].node = forest->root[i];
      traversal[i].stack = &stack[i];
     PREFETCH(forest->root[i], sizeof(forest->root[i]));
   /* steady state */
   while ( trees_left ) {
      for ( i=0; i<trees left; i++ ) {
        if ( traversal[i].node->left ) [
         traversal[i].stack->push( traversal[i].node->left );
         traversal[i].node = traversal[i].node->left;
        } else {
          n = traversal[i].stack->pop();
         if ( n == NULL ) { /* done with tree i */
           trees_left--;
            if (\overline{i} != trees left)
             SWAP( &traversal[i], &traversal[trees left] );
         process( n );
          traversal[i].node = n->right;
       PREFETCH( traversal[i].node );
   }
  }
```

Figure 7: Example of a Pipelined Tree Traversal.

(Replacement Sheet - drawings separated from claims)

```
Traverse ( tree ptr tree )
    /* local variables */
    /* level-order traversal prologue */
    PREFETCH( tree->root );
   enqueue( src queue, tree->root );
    for ( i=0, accumulating=true; accumulating; i++ ) {
      n = dequeue(src queue);
      if (n == NULL)
        return;
                             /* we're done */
     process(n->data);
      if ( n\rightarrowleft != NULL ) {
        PREFETCH( n->left );
        enqueue( dst-queue, n->left );
      if ( n->right != NULL ) {
        PREFETCH( n->right );
        enqueue ( dst queue, n->right );
      if ( src_queue->size + dst queue->size < PipeDepth ) {</pre>
        if ( i >= src queue->size )
          SWAP( src_queue, dst_queue );
      } else {
        accumulating = false;
        while ( src_queue->size > 0 ) {
          traversal[trees_left].node = dequeue( src queue );
          traversal[trees_left].stack = stack[trees_left];
          trees left++;
        while ( dst_queue->size > 0 ) |
          traversal[trees_left].node = dequeue( dst_queue );
          traversal[trees_left].stack = stack[trees_left];
          trees left++;
        1
      }
    /* steady state loop */
```

Figure 8: Example of a pipelined level-order tree traversal.